Argusi introduction

NGB Congres | Lunteren | 19 januari 2016

argus*I*

Your Supply Chain Analyst

2005

PhD Bas
Supply Chain
Optimization
"Collaborative Logistics
Transportation networks"
A modeling approach to
Hub Network Design

2007

Start Argusi
Supply Chain
Optimization & Synergy

PhD Frans
Supply Chain Synergy
"Horizontal Cooperation in
Transport and Logistics"
A gainsharing methodology

2006

Argusi

Logistics advisory, specializing in:

- Tactical and strategic network design and optimization
- Horizontal collaboration
- Humanitarian Aid and Logistics Optimization

- Started in 2007
- Office in old Brewery in Breda, the Netherlands
- 15 professionals, all with technical academic background
- Projects for 90% in business environment and for 10% governments and institutions

Netherlands: 6 top priorities in logistics

- 'NLIP': Develop common ICT system for the logistics sector

- Synchromodal Transport: increase share of integrated multimodal transport;

- Service Logistics

- Cross Chain Control Centers: transport bundling

- Trade Compliance & Border Management

- Supply Chain Finance

Connectivity

The Internet of Things (IoT)

- Some 8 billion devices connected to the internet right now

- Number increases by 5 million every day

But there is more...

- The Physical Internet (PI)

The physical internet

Case Study in the High Tech Industry

Towards a fruitful partnership

- Among 11 potential partners search for a succesful partnership

- Central warehouses in the Benelux

- Strong emphasis on Express (next day, Pre9, Pre12)

- High value products in a broad range of SKU's

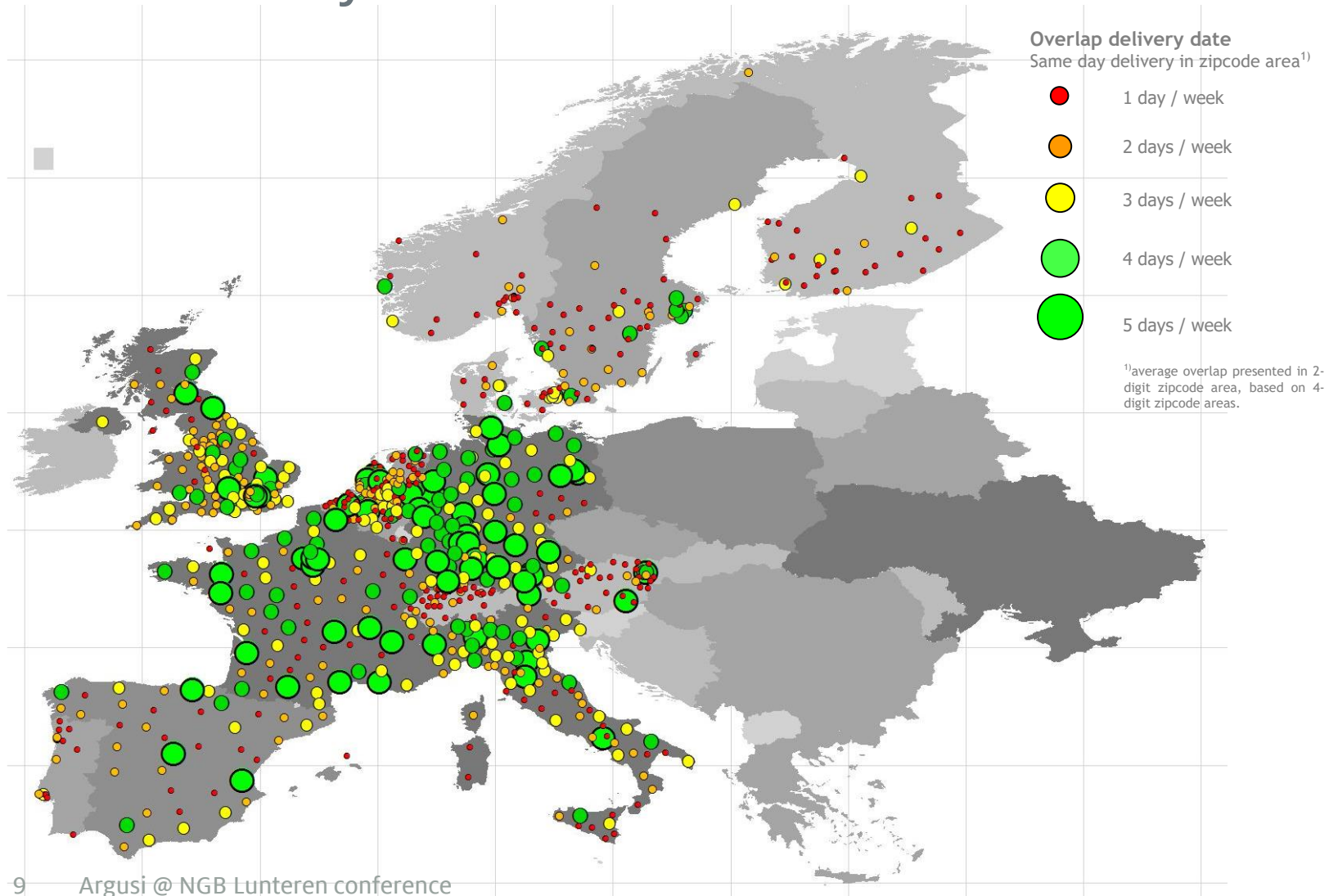- Customer base in Europe overlaps to a large extend

The first threshold

Finding a suitable partner. How can one find a suitable partner to collaborate with? This is one of the biggest barriers for successful collaboration. The effort a company has to put in, the associated costs, and confidentiality issues are important issues. It is obvious that a suitable partner can result in a cost reduction / service improvement but how can one find a suitable partner?

Detailed analysis

Overlap delivery date
Same day delivery in zipcode area[1]

- 🔴 1 day / week
- 🟠 2 days / week
- 🟡 3 days / week
- 🟢 4 days / week
- 🟢 5 days / week

[1]average overlap presented in 2-digit zipcode area, based on 4-digit zipcode areas.

Detailed Analysis

- 5 possible candidates

- Overlap of drops (duplication) of 43%
  Delivery on the same day, same adress, same service level

- Estimated cost reduction based on actual rates 6.4 million

- Therefore, a strong business case

The second threshold

Once the potential gains were known the next hurdle presented itself. How do we slice up the pie into fair pieces? This was the biggest challenge in the project. Do we use rules of thumb, easily explained and implemented?

Rules of thumb discussed
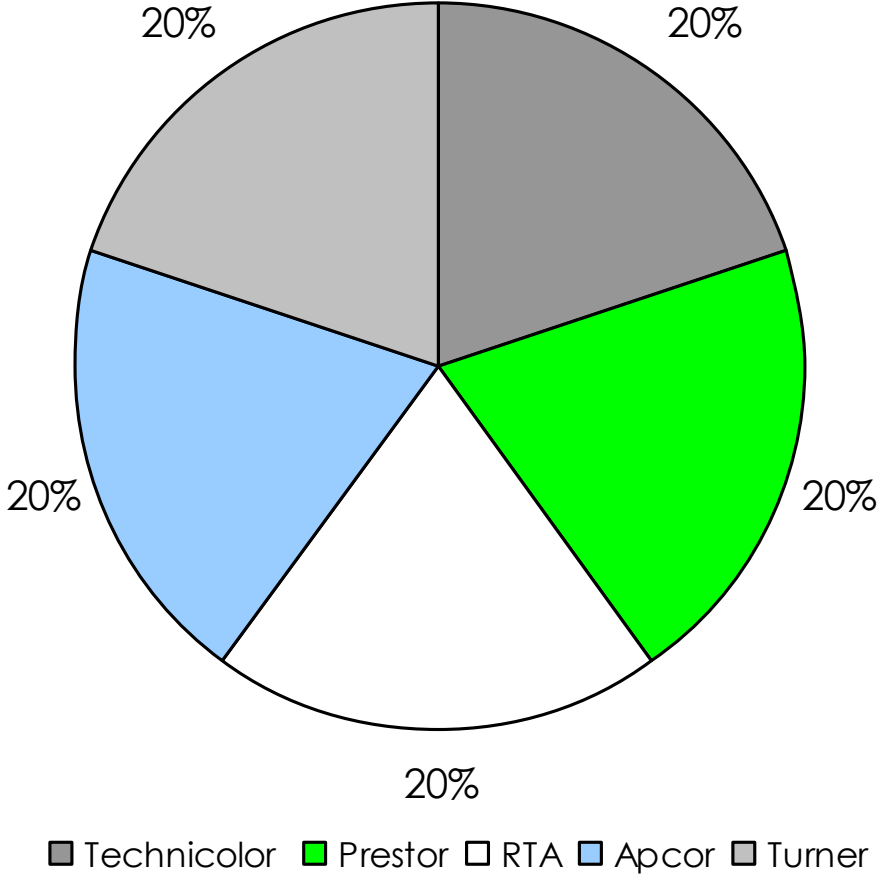
Equal share ?

Total pay-weight?

Ship-to-adresses?
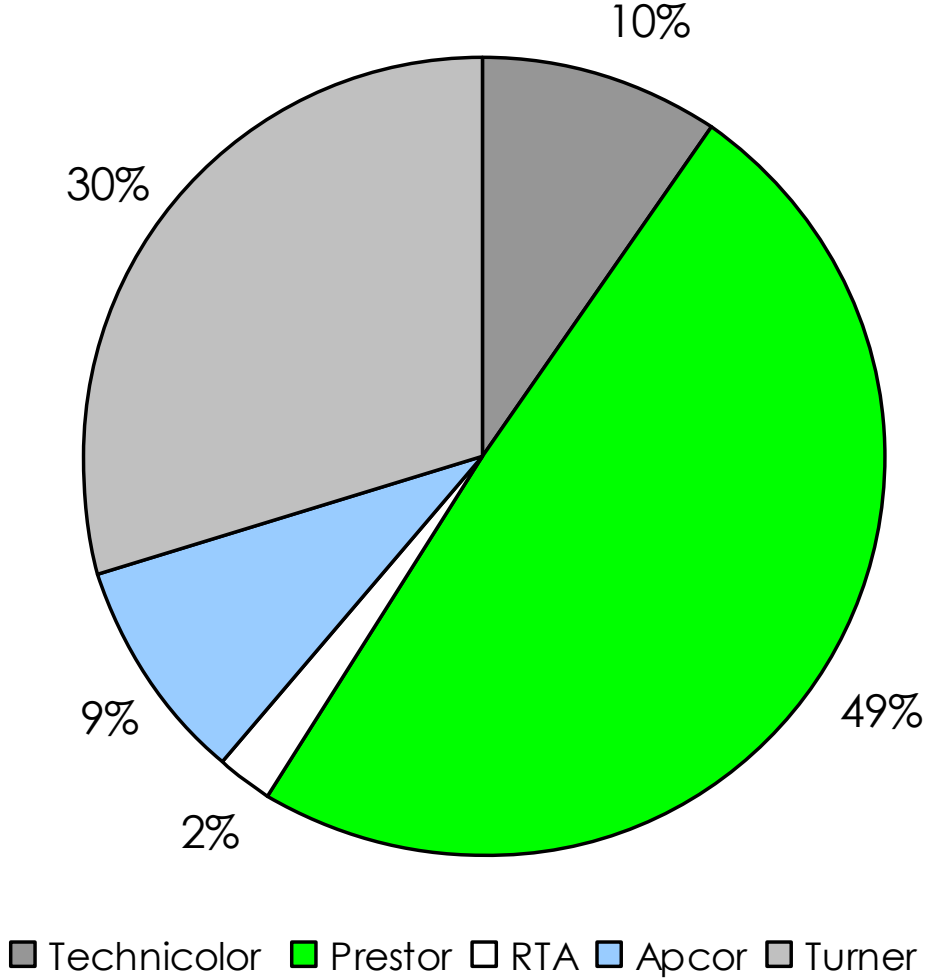
Number of shipments?

Marketshare / turnover?

The rules of thumb: equal share

20% 20% 20% 20% 20%
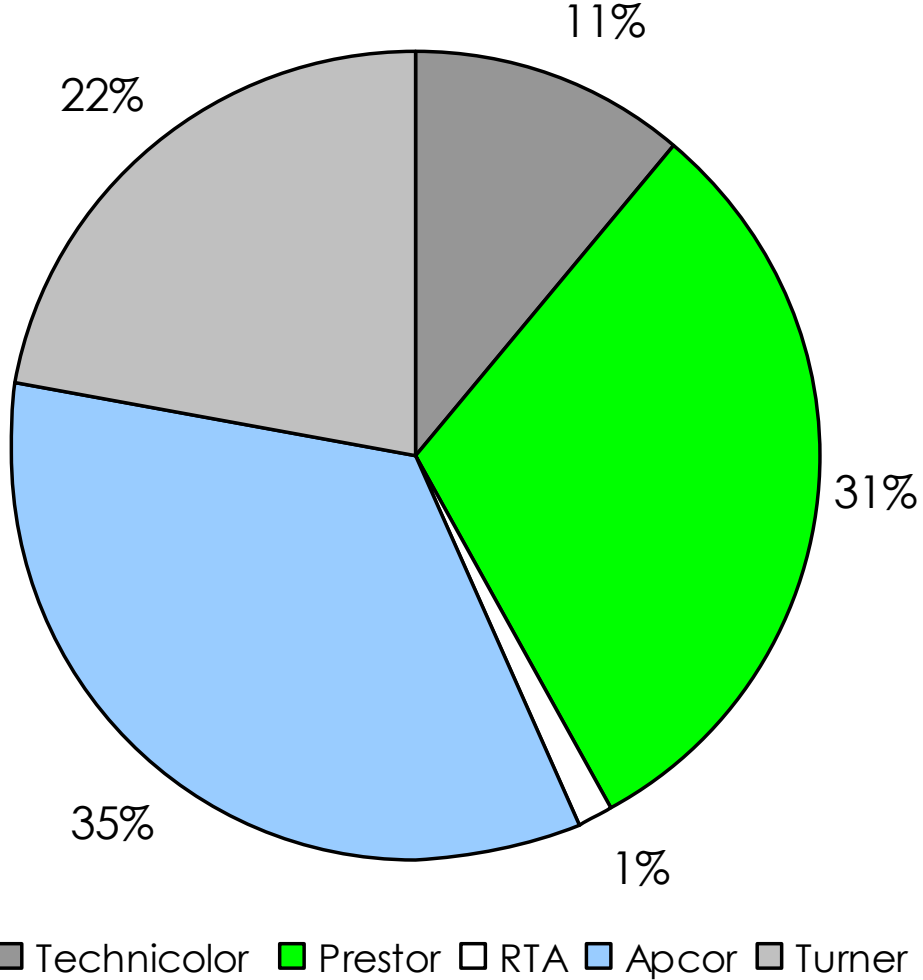
Technicolor Prestor RTA Apcor Turner

The rules of thumb: shipments

'Yeah right, we bring in about 50% of all shipments, we are entilted to more than 20% of the benefits. No way an equal split is fair' [Prestor]

10%

30%

49%

9%

2%

☐ Technicolor ☐ Prestor ☐ RTA ☐ Apcor ☐ Turner

The rules of thumb: pay weight

'However, measured in payweight we ought to get about 35%'
[Apcor]

Pie chart:
- Technicolor: 11%
- Prestor: 31%
- RTA: 1%
- Apcor: 35%
- Turner: 22%

Legend: ☐ Technicolor ☐ Prestor ☐ RTA ☐ Apcor ☐ Turner

The rules of thumb: ship-to-adresses

'Although we are a small player, we have quite a large number of ship-to adresses and the best rates to distant areas'
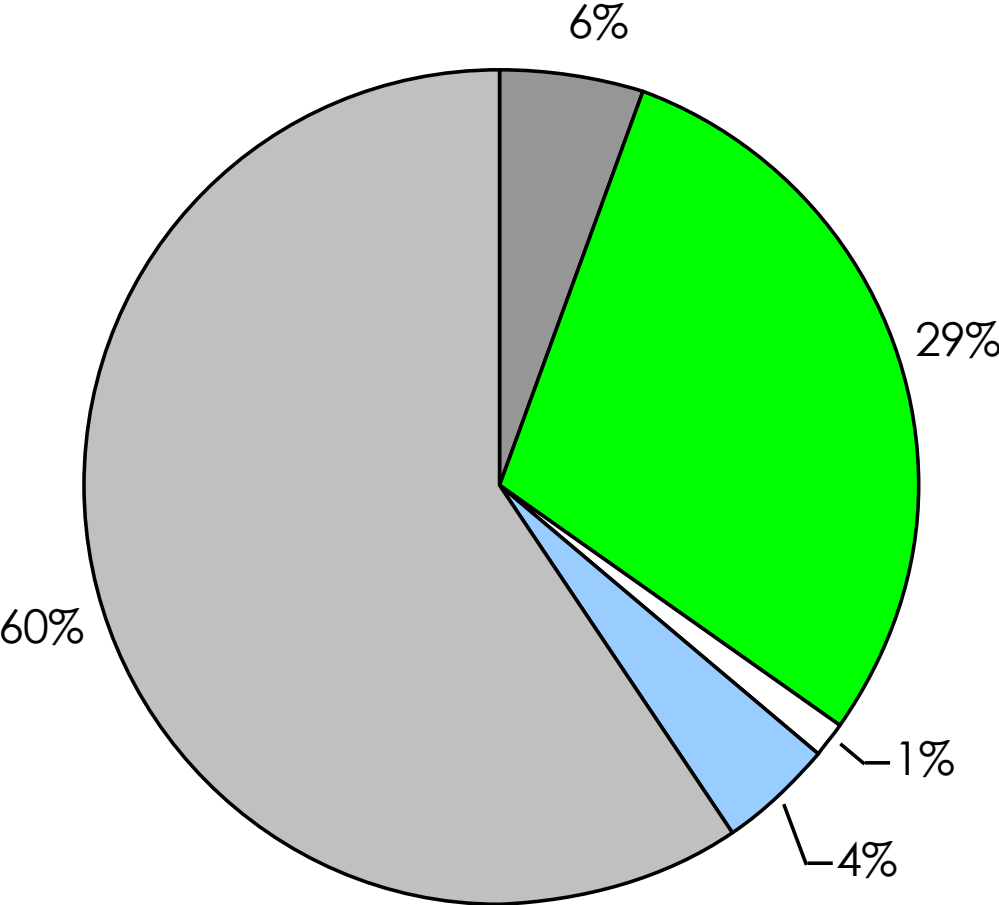*[RTA]*

28%

20%

16%

24%

12%

◻ Technicolor ◻ Prestor ◻ RTA ◻ Apcor ◻ Turner
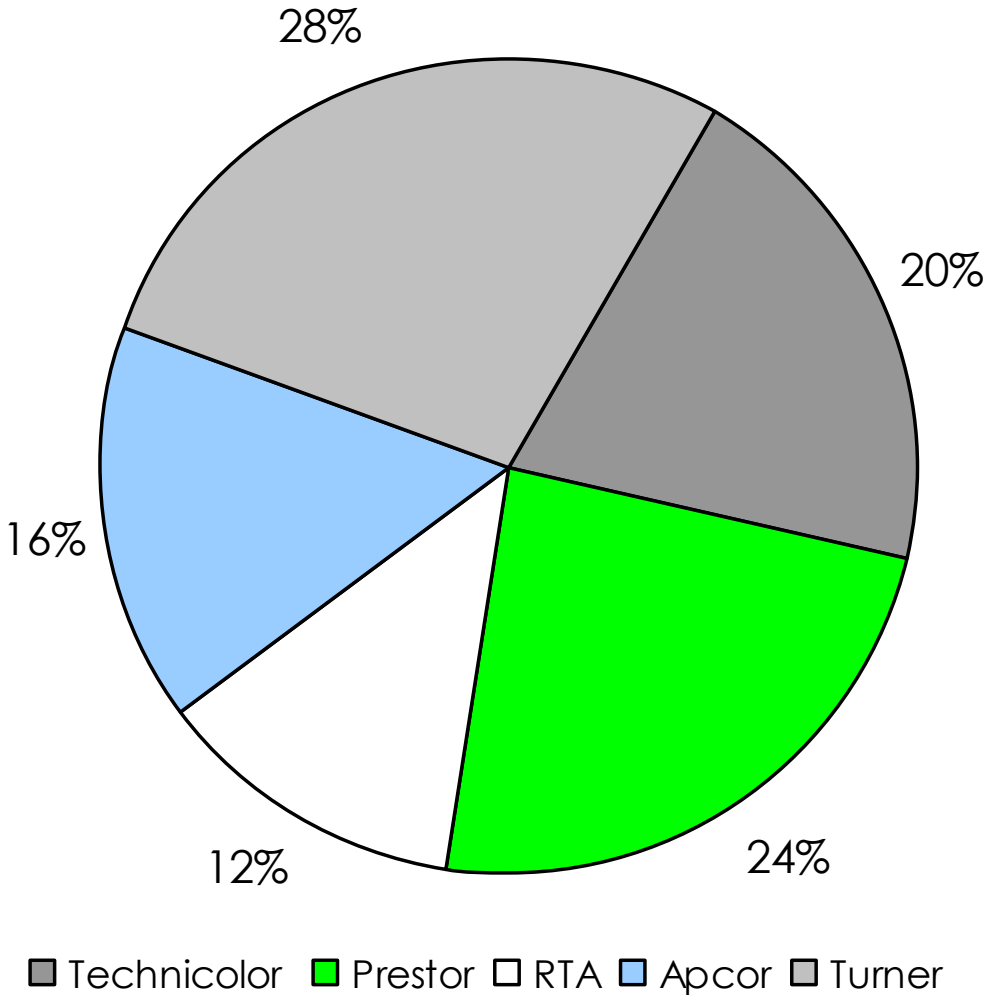
The rules of thumb: turnover

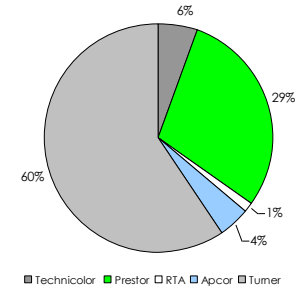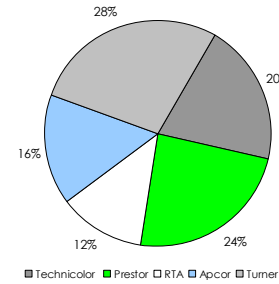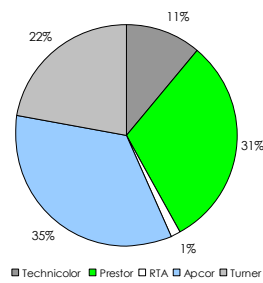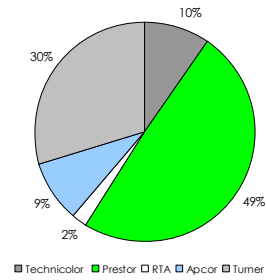*'We will not accept any ratio that is not in line with current marketshare to prevent any competitive advantage'*
[Turner]

6%

29%

1%

4%

60%
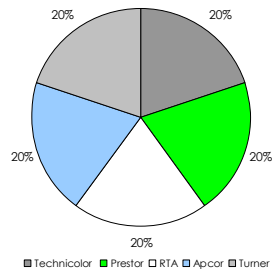
◻ Technicolor ◻ Prestor ◻ RTA ◻ Apcor ◻ Turner

Rules of thumb don't work

To prevent the project from failing we introduced cooperative game theory. Sharing the benefits and investments based on a fair and robust methodology.

Based on the <u>value</u> a potential participant brings to the table for the other participants.

Gain sharing: stability and fairness

Stability can be objectively determined:

- All possible subcoalitions should be better off in the consortium collaboration than they would be in a smaller group (see next slide)

Fairness is more subjective. However, game theory provides some well-defined fairness properties:

- <u>Efficiency:</u>   The complete savings of collaboration are distributed

- <u>Monotonicity:</u>   If player A adds more value to every coalition than player B, player A will get a higher payoff

- <u>Dummy:</u>   A player that adds no value to any coalition, will receive no payoff

- <u>Symmetry:</u>   Two players that add exactly the same value to every other coalition, will get the same payoff

- <u>Individually fair:</u>No player will suffer from collaboration (for each player, cost level after collaboration is not higher than before collaboration)

The **Shapley value** is the only rule that has all these properties.

Game theory: Shapley value

' A fair, robust, and relatively simple method to distribute the benefits'
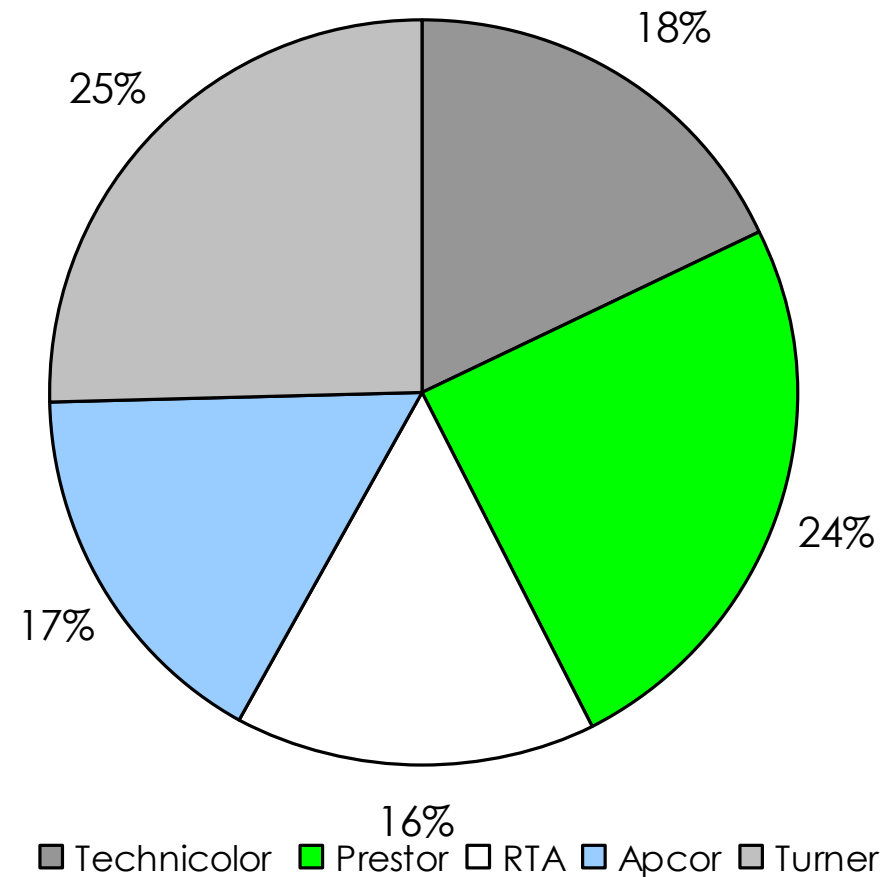
Some more details on how this works...

		Number of pallets										
		1	2	3	4	5	...	10	15	20	25	30	33
Destination	A	€ 70	€ 135	€ 195	€ 250	€ 295	...	€ 500	€ 710	€ 890	€ 1,060	€ 1,190	€ 1,240
	B	€ 84	€ 162	€ 234	€ 300	€ 354	...	€ 600	€ 852	€ 1,086	€ 1,272	€ 1,428	€ 1,488
	C	€ 49	€ 95	€ 137	€ 175	€ 207	...	€ 350	€ 497	€ 623	€ 742	€ 833	€ 868

Subcoalition	# Pallets	Costs
M	15	€ 710
S	10	€ 500
M,S	25	€ 1,060

Synergy / Efficiency gains:

€ 710 + € 500

- € 1,060 = € 150

But, how to allocate these efficiency gains in a <u>fair</u> and <u>stabile</u> way...?

Let's get back to our example

Hence, in any <u>stabile</u> gain

sharing rule for this situation:

- Company M never pays more than € 710;

- Company S never pays more than € 500;

- Company M and S together not more than € 1,060.

Subcoalition	# Pallets	Costs
M	15	€ 710
S	10	€ 500
M, S	25	€ 1,060

Otherwise, they would just split off from the consortium and start their own (smaller) collaboration, as this will save money.

Collaboration and stability can be illustrated by means of a spider graph.

| Subcoalition	Costs (when collaborating)	Costs (without collaboration)
M	€ 710	€ 710
S	€ 500	€ 500
M,S	€ 1,060	€ 1,210
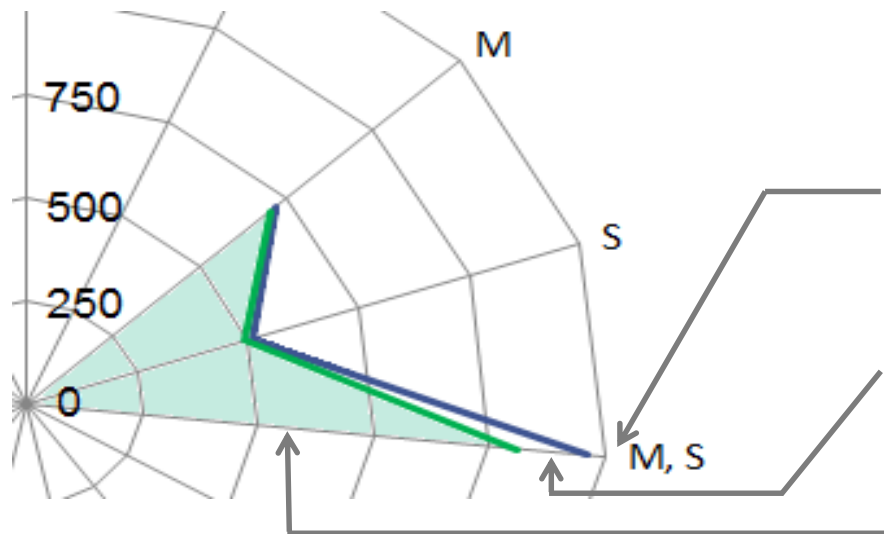
Blue line: Total costs if the subcoalition depicted at the endpoint is not collaborating

Green line: Total costs if the subcoalition depicted at the endpoint is collaborating

Shaded area: Tolerance area (called the 'core') for gain sharing rules that can be called stabile

Suppose that companies W and U enter the consortium
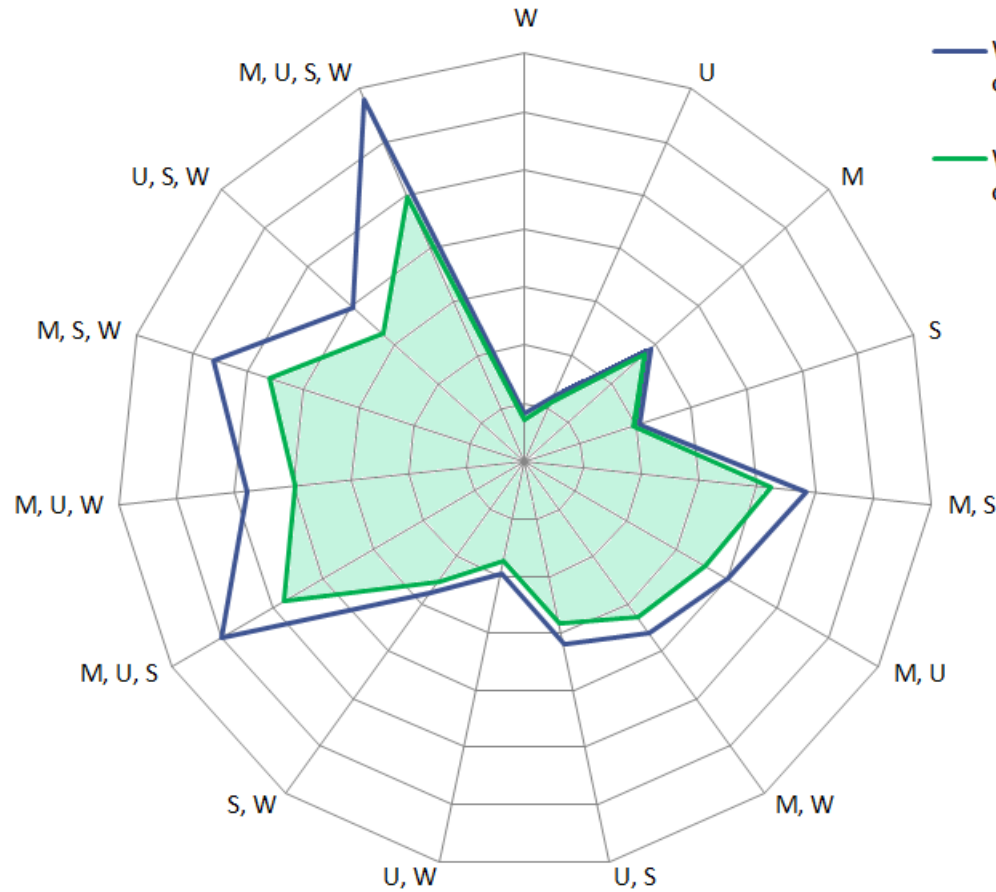
The same principle holds: to have a stabile collaboration, every subcoalition must have a cost level after gain sharing that is lower than before collaboration.

This graph helps to evaluate a gain sharing rule on **stability:** whenever a rule can be depicted completely within the shaded area, it is stabile; otherwise not.
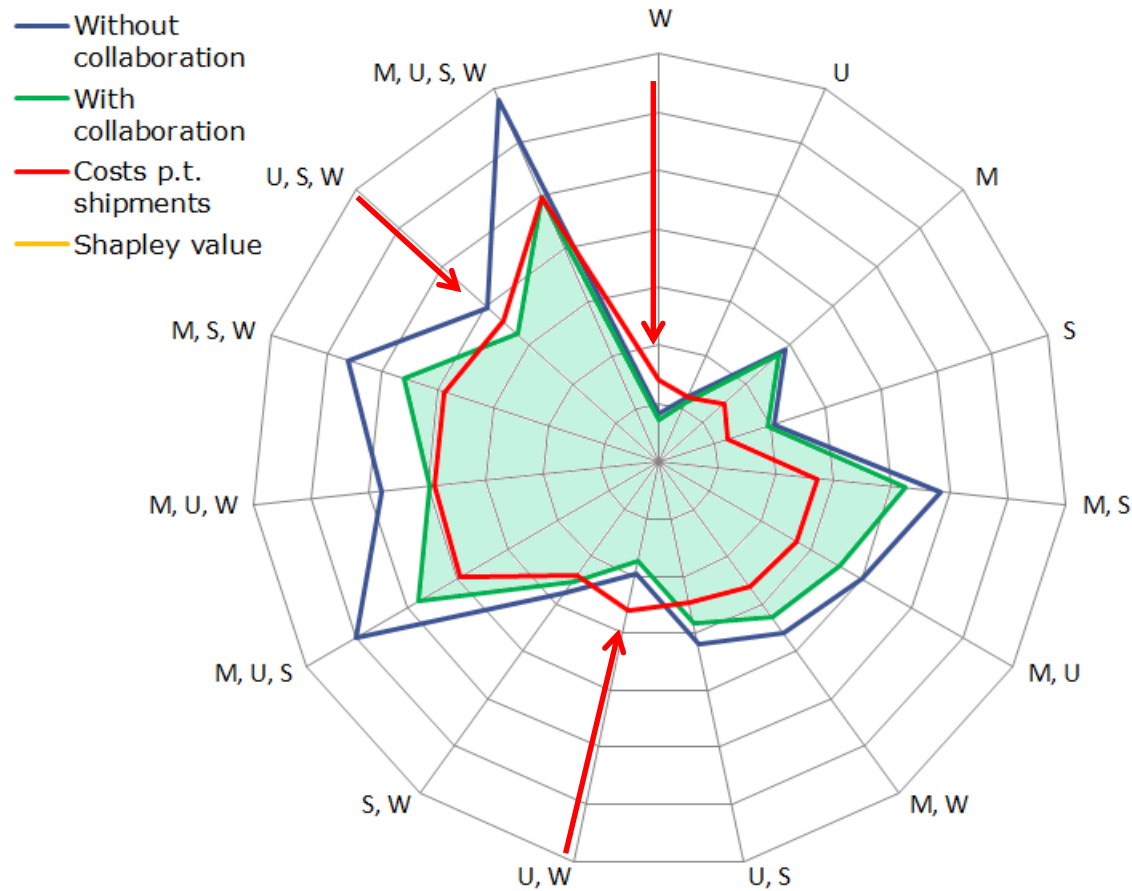
The red line depicts a gain sharing rule. It indicates what part of the total cost **under collaboration** is allocated to the companies in the subcoalition depicted at the endpoint.

Clearly, this gain sharing rule is not stabile, as the red line does not lie within the shaded area. The graph shows that gain sharing deserves some good thought, as the simple rule of thumb of cost division based on individual cost per shipment (rule w.r.t. red line), results in an **unstable situation**.

Company W, subcoalitions U, W and U, S, W are not satisfied with the gain sharings and would split off when applying this rule.

Rules of thumb don't work….
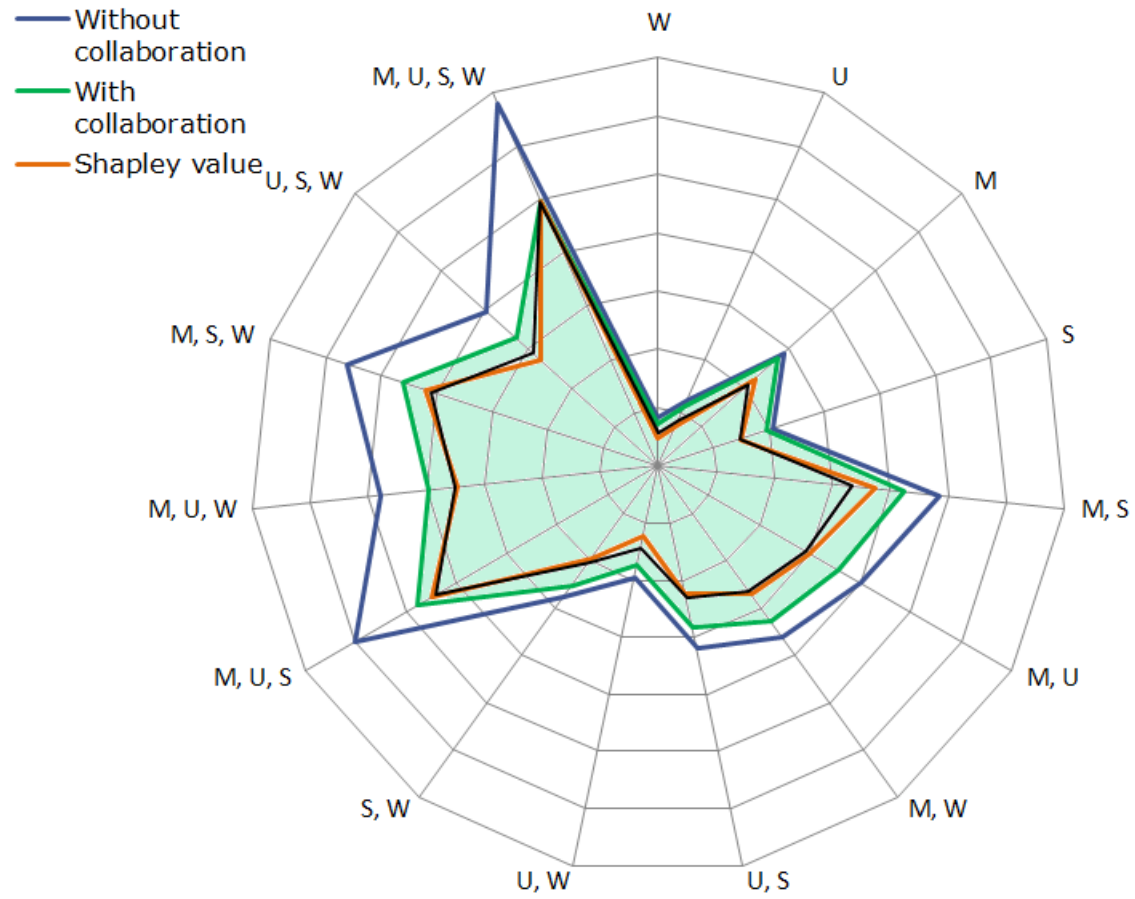
Procter & Gamble invitation: rail flows

Let's do better, together

Frans Cruijssen

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argus

'Ten commandments' of collaboration

1. **Have measurable goals**
2. Start simple, with a stepwise approach
3. Ensure sufficient capacity
4. Work on behavior, trust and commitment
5. Keep your eyes on the long term

6. Ensure good communication
7. Construct a good governance structure
8. **Agree on the financial model beforehand**
9. Be flexible to change agreements when necessary
10. Determine clear conditions for entry and exit

Prof. A.P. De Man